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US 4941215 A US 3523305 A

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(54) Automatic flushing device for toilet

(57) An automatic flushing device for a toilet comprises an infra-red detector for detecting a user of the toilet and then passing a signal to an electric motor (2) connected via a set of step-down gears to a drive shaft (36) which, in turn, is connected via driving gear and linkage (6) to a discharge valve (7).

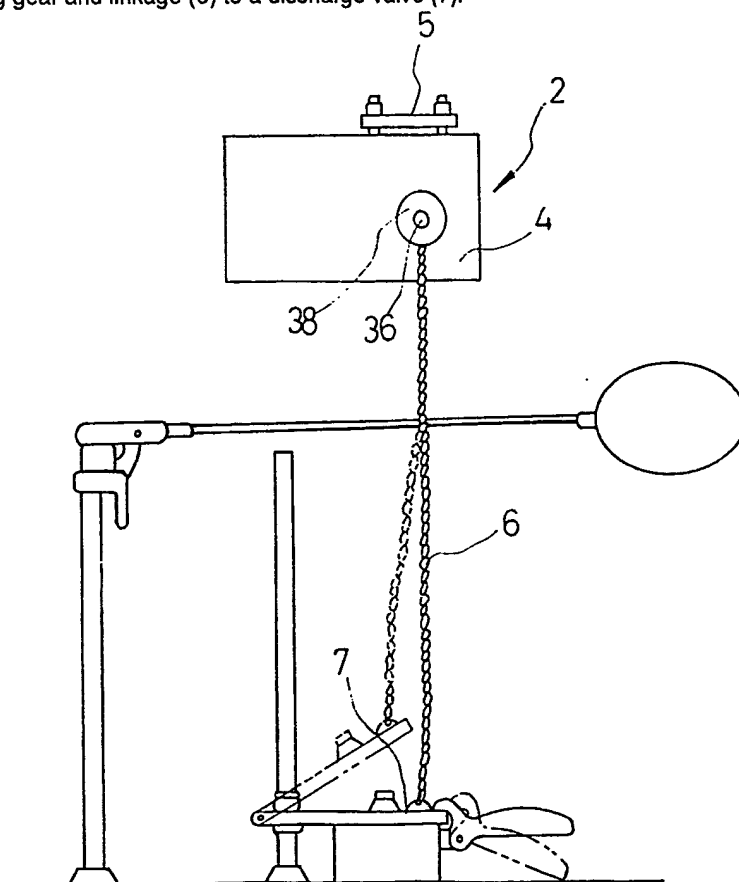


FIG 6

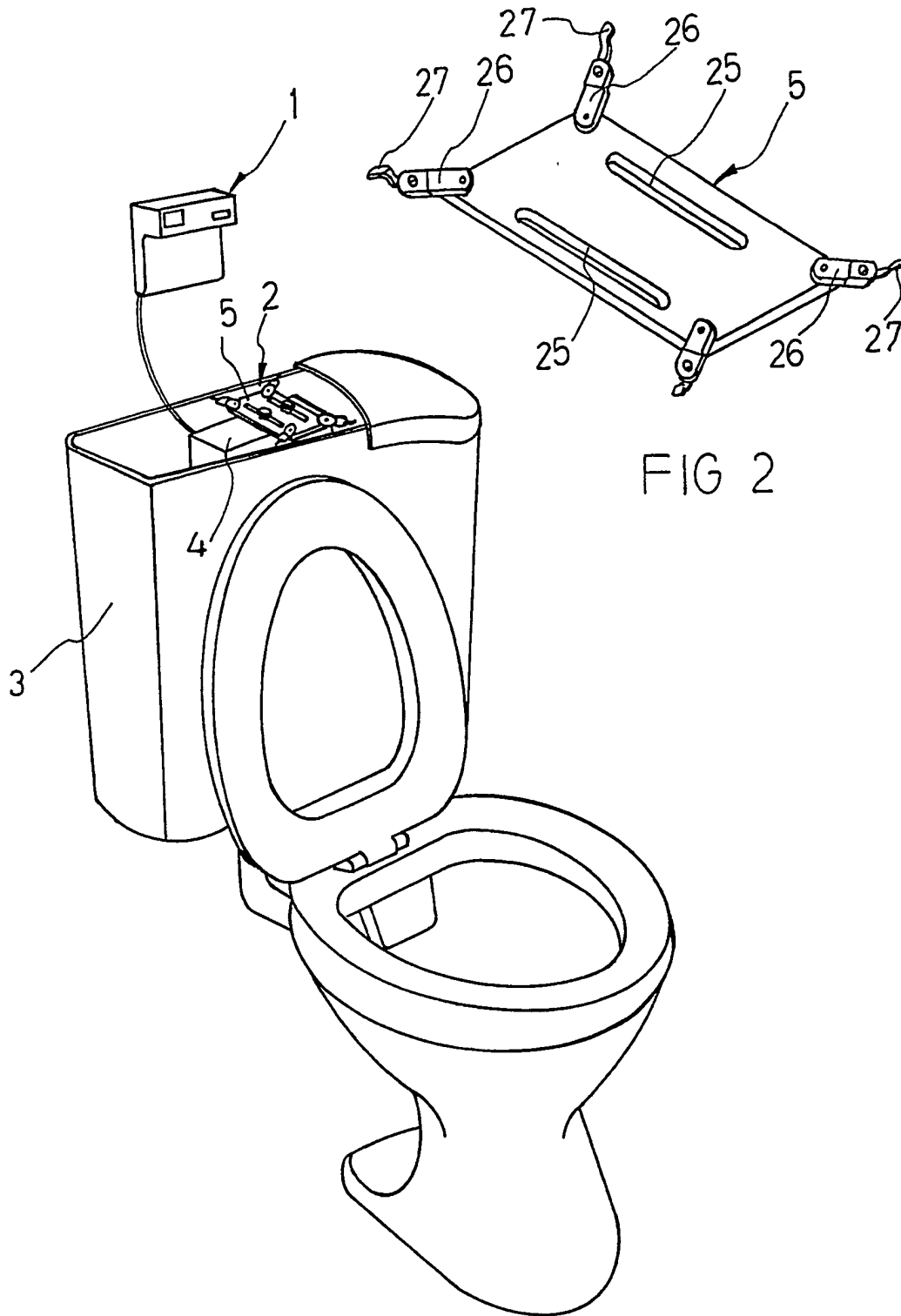


FIG 2

FIG 1

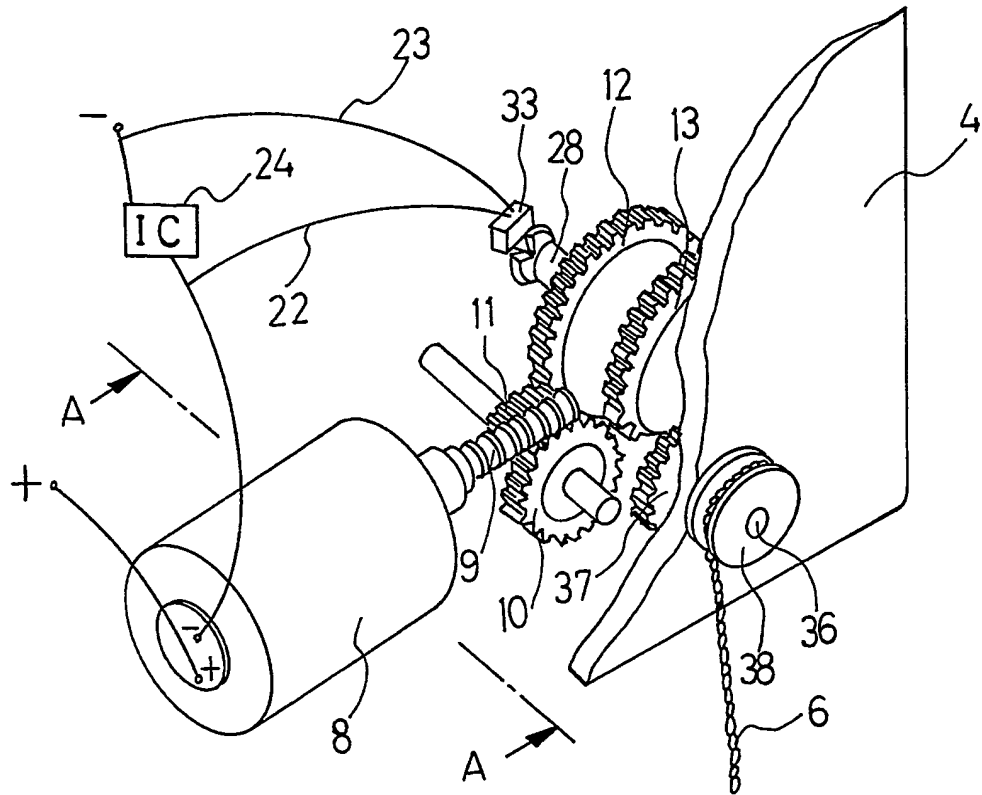


FIG 3

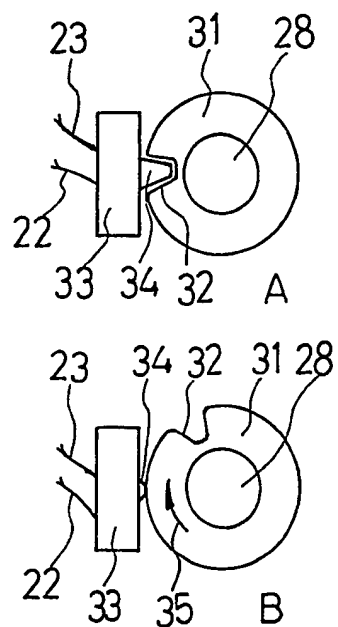


FIG 4

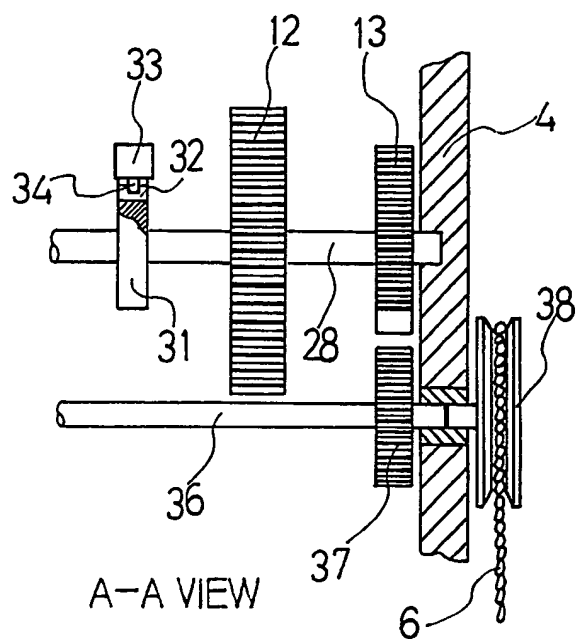


FIG 5

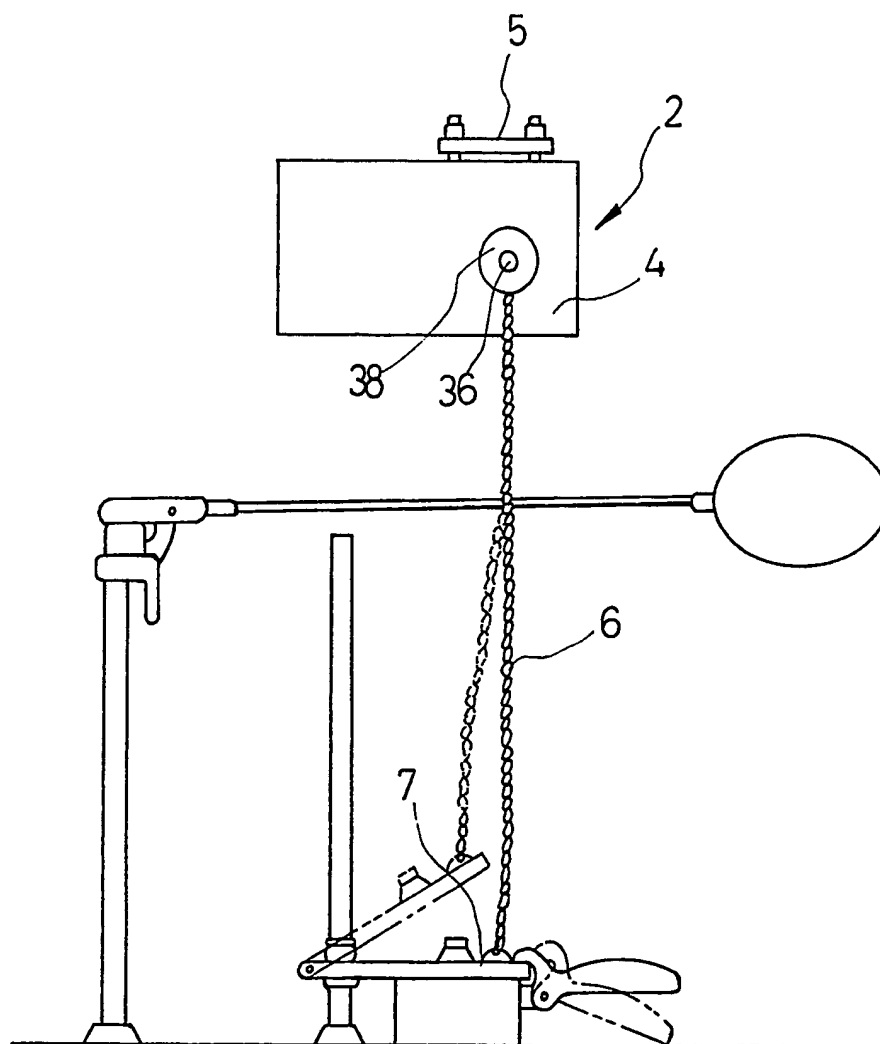


FIG 6

AUTOMATIC OPENING DEVICE FOR TOILET WATER TANK'S FLUSH DOOR

DESCRIPTION

5 This invention relates to an automatic opening device for toilet water tank's flush door, and particularly to a new one that upon the leaving of toilet user can right away get the water tank's flush door to open for flushing away the waste to keep cleanliness.

10 Conventional flush toilet, as we are aware, is typical of a handle on the exterior of its water tank which if pressed down can get the water tank's flush door to open for an immediate flushing away of the waste in the toilet. This way keeps the toilet to be clean and prevents the rest room from the leaking of bad smell. It is practical
15 in this sense. But due to its artificial operation, pressing down the handle after toilet use is easy to be forgotten by some toilet users in a hurry. If that happens, the rest room will soon be filled with bad smell and makes entering it next time substantially difficult. Such happening is particularly common in the public rest room.

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 The primary objective of the invention is to solve the problem above by providing an automatic opening device for toilet water tank's flush door which has features:

25 1. It, in place of only the flush door's artificial opening structure, still makes use of the water tank's original water initiating and flushing structure and can, therefore, be wide applied to any sort of conventional water tank.

30 2. It is of a small volume that makes it able to be mounted hidden in the water tank. Moreover, Its action force in perpendicularity to water tank's flush door is thus reduced to be the least and enables the less burdened motor to have a prolonged work life.

35 This automatic opening device for toilet water tank's flush door

consists of an infrared monitor and an actuating device. The infrared monitor, mounted on nearby wall at a higher level than water tank, senses the approaching of someone and upon his leaving after toilet use sends out a signal leading to the operation of motor. The actuating device, sealed in a case, includes a motor and a set of slow-down transmission gears connected to motor's output shaft for actuating a driving shaft into action. A compression wheel, mounted on the driving shaft, is with a vacancy on its periphery which is inserted by the button of a microswitch opposing against in normal time. The operation of motor, thereby, is under the control of compression wheel which may cease it once the driving shaft, driven by motor operation, has made a turning and brought the button back within the vacancy. A driving gear, also mounted on the driving shaft, has a partly toothed periphery of which the toothless part opposes against a following gear mounted on a following gear nearby. The driving gear in operation may engage and bring following gear to turn along. The following shaft has its one end extending out of the case and connected with a fixed pulley. Via an actuating rope or chain, the fixed pulley is in connection with the water tank's flush door. The turning of the fixed pulley which is driven by following shaft, therefore, will roll up the actuating rope or chain and get the flush door to be pulled open. Actuating rope or chain then will be pulled back to its original length by an automatic closing of the flush door after the flushing is over.

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A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:

Fig. 1 is a perspective view of the invention positioned in the water tank of a toilet wherein its tank cover is partly omitted;

Fig. 2 is an enlarged view of the seat plate of the invention in Fig. 1;

Fig. 3 is a perspective view of the inside structure of the

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actuating device sealed in case in Fig. 1, and with the case body omitted mostly;

Fig. 4 shows the interacting between the compression wheel and
 75 microswitch thereof in Fig. 3;

Fig. 5 is a sectional view taken along A—A line in Fig. 3; and

Fig. 6 shows the in-use state of the invention in water tank.

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As Fig. 1 shows, the invention comprises an infrared monitor 1 and an actuating device 2. Infrared monitor 1, mounted on nearby wall at a higher level than water tank 3, is a case body arranged with the infrared detecting circuit in it. Infrared monitor 1 senses
 15 the approaching of someone and upon his leaving after toilet use sends out a signal to touch IC to start motor operation. Since the infrared detecting circuit is a general one and is not the target of the invention's application, more description about it is omitted. Actuating device 2, sealed in case 4, is adjustably fixed by means
 20 of seat plate 2 at the open part of water tank 3. Adjusting actuating device 2 to be perpendicular to the draw part of water tank's flush door 7 (as Fig. 6 shows) would result in the least use of action force.

25 As Figs. 3, 4 and 5 show, actuating device 2 in case 4 includes a small motor 8 and a worm 9 connected to motor's output shaft and meshed with worm wheel 10. A slow-down transmission small gear 11, mounted on the same axis with worm wheel 10, meshes with a big wheel 12 which is positioned on a driving shaft 28. At one end of driving
 30 shaft 28, there is a driving gear 13 which has a periphery with only about a half circle of teeth around it and puts its toothless part in opposition against a following gear 37. Following gear 37 is relatively small in diameter and positioned on a following shaft 36 near driving gear 13. In operation, driving gear 13 would engage
 35 and bring following gear 37 to turn along. Following shaft 36 has

its one end extending outside of the side wall of case 4 and connected with a fixed pulley 38 (as Fig. 5 shows). Fixed pulley 38 has connection with the upper end of an actuating rope or chain 6, while the lower end of it links to water tank's flush door 7 (as Fig. 6 shows). As can be found, at the other end, or other suitable place, of driving shaft 28 is mounted a compression wheel 31 with a vacancy 32 on its periphery which is inserted by the button 34 of a microswitch 33 opposing against it (as Fig. 4A shows). As button 34 is within the vacancy 32, microswitch 33 is in open circuit. In case that button 34 is driven away from vacancy 32 and gets pressed by compression wheel's periphery, microswitch 33 then is in closed circuit. From microswitch 33, a power lead 22 is connected to the negative pole of small motor 8 and the other power lead 23 to the power source's negative pole. Between power leads 22, 23 is connected an IC 24 (as Fig. 3 shows). In normal time, button 34 of microswitch 33 is within vacancy 32, and the power source of small motor 8 is in open circuit.

As the leaving of toilet user is detected by infrared monitor 1 (as Fig. 1 shows), a signal sent out will lead to the starting of small motor 8. At that time, with IC 24 supply temporary electricity, compression wheel 31 is driven to turn. Once button 34 of microswitch 33 deviates from vacancy 32 and gets pressed by compression wheel's periphery, microswitch 33 then is in closed circuit leading to conduction for electricity supply (as Fig. 4B shows). At the same time, the driving gear 13, at the other end of driving shaft 28, is driven to turn in a direction as arrow 35 shows and gets meshed with following gear 37. The turning of following gear 37 hence leads to the turning of fixed pulley 38, which therefore rolls up actuating rope or chain 6 and gets flush door 7 to be pulled open. As compression wheel 31 has made a turning and brought back the microswitch 33 to vacancy 32, electricity supply ceases and operation of small motor 8 comes to an end. At that time, driving gear 13 releases following gear 37 and once again puts its toothless part in opposition against it. Actuating rope or chain 6 then will be pulled back to its original

length by an automatic closing of flush door 7 after the flushing is over.

As Figs. 1, 2 show, actuating device 2 in case 4 is connected
5 beneath a seat plate 5, which is a plane one with two lengthwise
slots 25 for connecting case 4 and allowing adjustment to the case's
front and back position in water tank 3. The case's left and right
position in water tank 3 is adjusted by moving seat plate 5. In
this way, fixed pulley 38 and actuating rope or chain 6 of actuating
10 device 2 can be adjusted to be perpendicular to flush door 7 (as
Fig. 6 shows) to prevent unnecessary division force.

At four angles of seat plate 5, there are arranged a turnable
hook rod 26 and a hook strip 27 respectively. By means of turning
15 hook rod 26, the invention may be coordinated with any different
thick water tank 3. And tank cover may still cover water tank 3
after hook strip 27 hooks the upper rim of water tank 3.

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CLAIMS:

1. An automatic opening device for toilet water tank's flush door comprising:
 - 5 -an infrared monitor on nearby wall at a higher level than water tank for generating a signal to start motor into operation upon the leaving of toilet user;
 - and with major characteristics in an actuating device which comprises:
 - a small motor having its output shaft connected with a set of slow-
 - 10 down transmission gears for actuating a driving shaft into action, the negative pole of the motor via a power lead connecting an IC, said IC positioned between the power leads of motor's negative pole and power source's negative pole and between two power leads from a microswitch so as to supply temporary electricity for the motor's
 - 15 starting;
 - a driving shaft connected with a compression wheel at its one end or other suitable position, said compression wheel with a vacancy on its periphery being inserted by the button of a microswitch in opposition in order to cease the operation of said motor whenever driving shaft
 - 20 has made a turning;
 - a driving gear connected to said driving shaft's other end and having a partly toothed periphery of which the toothless part is put opposing against a following gear, said following gear relatively small in diameter mounted on a following shaft, said driving gear in its beginning
 - 25 to turn meshing with said following gear and bring it to turn along; said following shaft having its one end extending outside of the case's side wall where to connect a fixed pulley, said pulley connected with the upper end of an actuating rope or chain while its lower end connects the water tank's flush door;
 - 30 Whereby as the leaving of a toilet user is detected by infrared monitor, a signal sent out will lead to the starting of motor, bringing the driving shaft to make a turning to result in the opening of the water tank's flush door for a flushing.
 - 35 2. An automatic opening device for toilet water tank's flush door

according to claim 1 wherein said actuating rope or chain will be pulled back to its original length by an automatic closing of the water tank's flush door after the flushing is over.

3. A device substantially as hereinbefore described with reference to, and as shown in the accompanying drawings.

4. Any novel feature or combination of features described herein.